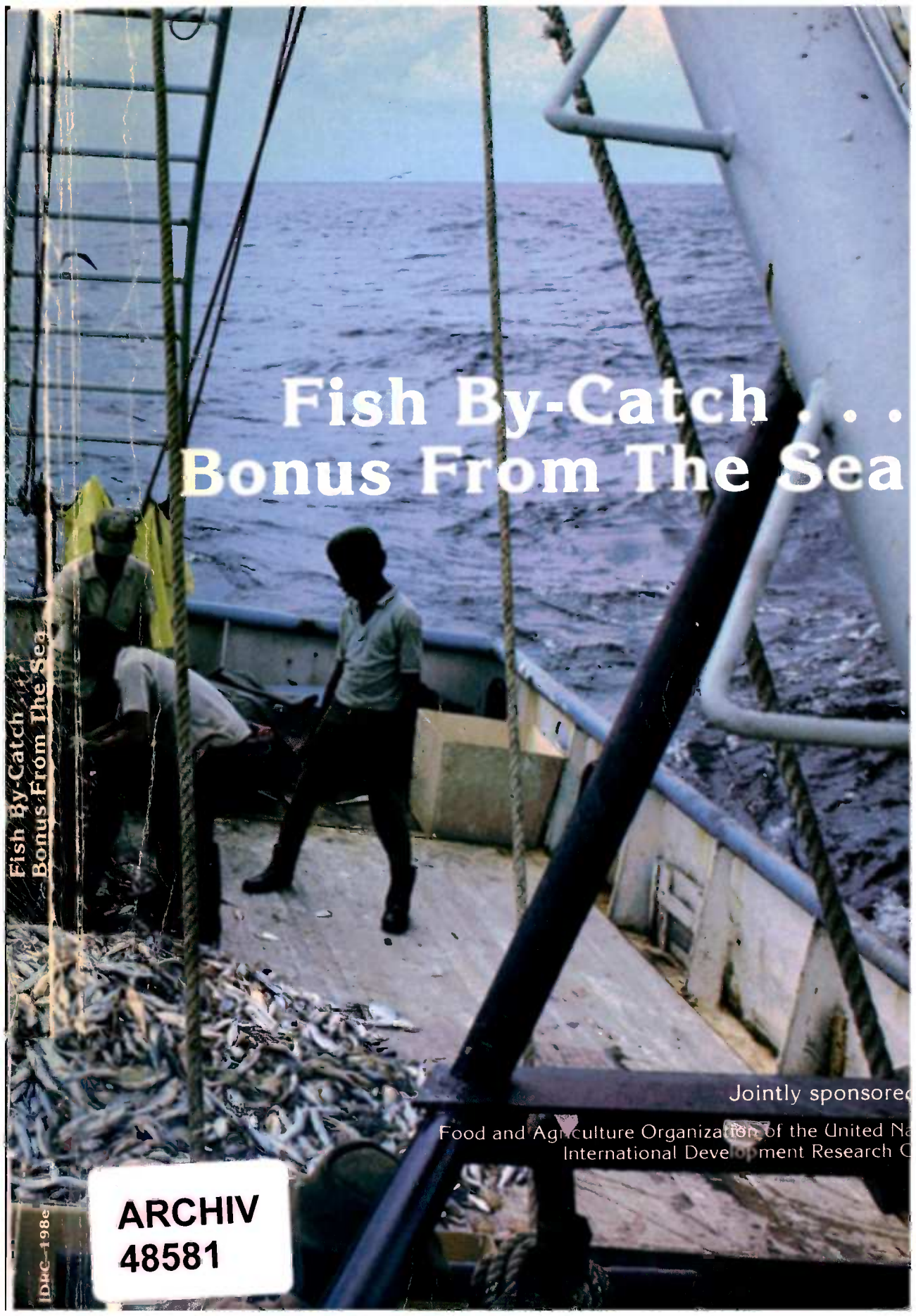

Fish By-Catch
Bonus From The Sea

IDRC-198e

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Guyana

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As the Guyana by-catch project prepares to expand production to an industrial scale, a look at the initial stages of the project, the problems that were faced, and the way it evolved is worthwhile. Producing quality foodstuffs has always been the aim of the project, and the changes in consumers' attitudes toward fish, especially shark, are a sign that the project has succeeded.

In the 1970s, the Guyanese government became concerned about the viability of the shrimp industry as well as the recovery of the by-catch being dumped. It met with shrimp-vessel owners, and the two groups agreed that each trawler would land 1 t of edible fish for each shrimp trip in return for the removal of an export tax and a nominal payment from the government. The quantity was to be made up of selected species from the catch of the last 3–4 days at sea. The trawlers began reluctantly to land the by-catch, which was subsequently delivered to the government's embryonic fish-processing plant.

The first hurdle was to devise a method to separate the fish from the shrimp and, thus, to alleviate the concern of captains and crews that the presence of the fish was damaging their shrimp. Packing of the shrimp in polyethylene bags was introduced. The fish were to be washed and air freeze-dried in the passageway of the hold before storage.

When landed at the docks of the various companies, the fish had to be collected and transported to the processing plant operated by the government. No vehicles were available for the regular transport of the fish, no schedule existed for the arrivals of the trawlers, and invariably the quantity delivered was not 1 t but 5–7 t.

Because of the ad-hoc nature of fish deliveries, processing could not be streamlined. Further, the plant was operating with staff who were employed on a day-to-day basis.

The manufacture of salted–dried and smoked fish from indigenous species was begun without product-development work. As a result, the quality of the final product varied considerably, and consumers were unwilling to purchase the products.

These problems, as well as the rationale for the efforts, attracted the attention of the IDRC of Canada and were the basis for a project to develop ways of using the by-catch more effectively: in cheap foods suitable for distribution initially throughout Guyana and ultimately throughout the Caribbean. The achievement of this goal would increase the amount of protein available to the population as well as save on foreign exchange through the reduction of imports.

Specific objectives of the first phase of the project were to:

- Assess the abundance and species composition of the available resource;
- Study existing marketing and consumption patterns for imported fish;[1]
- Develop low-cost products such as salted, smoked, minced, and pickled fish;
- Develop high-value products in fresh, frozen, and canned forms;
- Develop miscellaneous products such as ready-cooked and boiled fish, fried fish, canned anchovy-like products, vegetable products, and soup mixes;
- Develop recipes and publications for the promotion of the new products; and
- Develop standards and techniques for quality control.

Work in product development focused on product substitution and product replacement, with particular emphasis on products that were either simple to process, cheap to store, or convenient to use. The investigations were influenced by traditional tastes and customs as well as the particular (and sometimes peculiar) local-market conditions. Dried, salted fish; smoked fish (hard and soft); pickled fish; dried, salted mince; fish paste; fish sausage; fish jam; and canned fish were

[1]Importation of fish products into Guyana has now been banned.

studied. In-house sensory evaluation, consumer acceptability, promotion, and education sessions were conducted in step with the product-development work.

Promotion and Marketing

Initial consumer acceptability trials took the form of tasting parties, scheduled for lunch time and catering to about 150 persons invited by means of a notice in the newspaper. A recipe for each dish was made available to as many visitors as possible. The results of the initial tests were generally favourable. However, they did indicate the need for changes in textural characteristics of some of the products. Equipment used in the preparation of dishes was standard for most kitchens in the area.

Efforts at consumer education revolved around the Kingston plant. Periodically, groups of about 20 consumers were invited to tour the plant and observe the production lines. At the end of the visit, the groups were invited to sample a few dishes prepared by the test kitchen and were given recipes to take home.

The products were promoted at both special-invitation luncheons with themes, such as "Fish for Christmas" and "There's more to fish than frying," and less-elaborate luncheons open to the public.

A significant achievement of these consumer-oriented exercises was the change in attitude to one fish in particular — shark. When the project started, the demand for shark or any of its products was extremely low; now, a large number of consumers specifically ask for it in dried, salted form.

In 1980, the Caribbean Community (CARICOM) Secretariat collaborated with project personnel sponsoring a study on consumer attitudes to fish and fish products. Among other things, the study sought to:

- Identify consumer attitudes to fish and fish products;
- Develop attractive and appropriate packaging for retail presentations of selected fish products; and
- Determine consumer acceptance of the products developed by the project.

The study was conducted in Antigua, Barbados, Grenada, Guyana, Saint Lucia, and Trinidad and Tobago. The findings were promising. The meal-eating behaviour of consumers in these areas indicated clearly that fish is a dietary staple — either first or second choice among sources of animal protein for the midweek meal. Fresh fish was preferred, followed by salted fish. The significance of these findings was that they showed potential not only for the domestic market but also for the export market. One can surmise that the major product — salted fish — could create a sound reputation and open up markets for other products such as fish cakes, fish sausage, and fish pâté. The potential is immense but can only be realized by a sound and versatile production unit.

Small-Scale Production

The need to provide consumers with a variety of food products forced the commencement of production before any significant results were obtained through research and development. In 1972, a portion of a building, which was formerly an animal-feed mill, was made available for initial production efforts. This building was used until 1975 when it was closed for reconstruction into the Kingston Research and Development Centre.

Then, fish were channeled to the processing lines primarily by size. In general, small fish such as *Macrodon ancylodon* (bangamary) and some *Micropogon furneri* (croakers or double-belly basha) were selected for smoking or pickling, and larger fish like *Cynoscion virescens* (trout) and some croakers and *Carcharinus* sp. (shark) were to be salted and dried. The *Caranx hippos* (cavalli or cravalle) was also used as raw material for smoking because of its characteristic dark flesh.

The fish to be smoked were gutted but not headed; the backbone was not removed. The exceptions were the cavalli, which were filleted. The dressed fish were placed in a saturated brine for 2–3 days, then removed, drained, and placed in the smoker. They were smoked for 8–10 hours, after which they were ready to be marketed, the salt content being about 14% and moisture content about 40%. The smoking temperature was about 45°C — low enough to avoid cooking the fish. Smouldering softwood sawdust was used to generate the smoke. The smokers were locally designed and constructed.

At first, the fish to be dried and salted were cured in a modified "gaspé" cure method. In this method, the dressed fish are placed in

brine with alternate layers of salt for 4–5 days. They are then stacked or piled for 1–2 days before being dried. Later, the "kench" cure method was introduced. Here, the dressed fish are packed on stands with alternate layers of salt. The juices from the fish are allowed to drain away. After 2 days, the pile of fish is restacked so that the upper layers are at the bottom and vice versa. After a further 2 days, the fish are removed from the pile, and the adhering salt is brushed off. The fish are then dipped briefly into water before being dried.

In the early days, drying was artificial: a direct-heated, hot-air dryer at a temperature no higher than 45°C. Later, a locally constructed indirect-heated, hot-air dryer was used. Its use was discontinued after a short while, however, because of its poor design. Sun drying on covered racks was the next method used, and a greenhouse-type solar dryer is currently being tested. However, mechanical dryers and smokers seem to be needed to stabilize the operation.

Several simple-to-process products were introduced to the market either through the outlets at Guyana Fisheries Ltd or through the leading supermarkets. Among the products were fish fillets; frozen fish blocks; fish steaks; whole, dressed fish; and whole round mixed fish. The size of the fish influenced the end-product. For example, larger fish like *C. virescens*, *Epinephelus tauvina* (grouper), or *Lutjanus aya* (snapper) were filleted or made into blocks or steaks, whereas small fish such as *Nebris microps* (butterfish), *M. ancylodon*, or *M. furneri* were sold butterflied, whole dressed, or as mixed fish in the round. Prices ranged from G$0.45/lb. ($1.00/kg) for mixed fish in the round to G$3.00/lb. ($6.50/kg) for snapper steaks.

In addition to these standard and traditional products, some convenient commodities were developed and produced on a limited scale. Hot, smoked fish were marketed as breakfast fillets. A smoked fish pâté, margarine, local seasonings and spices, and a fish sausage were also developed (Table 1).

Table 1. Quantities (kg) of foodstuffs produced by Guyana Fisheries Ltd.

Fish product	1978	1979	1980
Processed (primary products)	127372	168334	347475
Dried, salted	27273	59013	74168
Smoked	34091	19113	29545
Pickled	22727	2597	2627
Minced	–	17925	–
Paste	–	1167	1898
Sausage	–	–	940

Two important constraints to the production efforts were, and still are, the lack of a steady, uniform supply of raw material and the lack of sufficient production capacity.

Planning for Expansion

A number of factors influence plans to expand the current level of operations. Among these are the collection and handling of the by-catch; continued research and development; quality control; equipment; consumer promotion; and management. Currently, the by-catch being landed represents the harvest of the last 3–4 days of a shrimping trip. Yet, the trawlers are at sea for about 30–35 days. A system that can conveniently collect the earlier harvest of incidental catch has yet to be developed. Various suggestions have been made, including the use of collector vessels and floating rafts with marker bouys. Sponsored by the CARICOM Secretariat, a Canadian consultant group is at the moment evaluating the alternatives with a view to identifying the most feasible.

Research and development in methods of harvesting, processing, and marketing need to be continued, as do efforts to standardize processes for industrial-scale production. A spinoff activity would be the refinement and continued development of nonfood products such as shark leather. Applying the results of development work depends on appropriate equipment, some of which may have to come from outside Guyana. Recently, Guyana Fisheries Ltd acquired a range of equipment to boost its production capability.

To date, the consumer promotion and education exercises have played a major role in increased utilization of fish and fish products in Guyana. A critical aspect of this work is recipe development, demonstration, and dissemination. As activity on product development and production increases, consumer promotion programs will be tailored to acceptability and utilization.

All of these facets of the expansion program need to be coordinated and directed by an innovative and dedicated team. Unless the

various elements are effectively managed and executed, the potential utility of the resource — the shrimp by-catch — will not be realized. To date, despite various obstacles, significant achievements have been recorded. I believe that this pattern will continue.